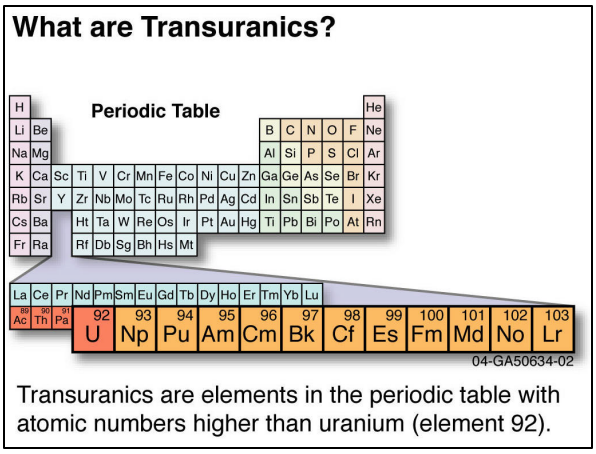
What are transuranic elements?

Transuranic elements are those "beyond" uranium

All matter is divided into about one hundred different chemical elements. The lightest element is hydrogen, #1. Element #92 is uranium, which is the heaviest element found in nature in significant amounts. The transuranic elements are those artificial elements beyond uranium, especially neptunium (93), plutonium (94), americium (95), and curium (96).



Transuranics are elements in the periodic table with atomic numbers higher than uranium (element 92).

Where do transuranic elements come from?

Transuranic elements are created in nuclear power plants by uranium absorbing or capturing neutrons. Fresh nuclear fuel is 100% uranium, generally in the oxide form. Used nuclear fuel is about 94% uranium, 1% transuranic elements, and up to 5% fission products. The fission products are waste - they result from splitting uranium or transuranic elements, thereby creating energy. Fission products are radioactive as they decay to stable isotopes.

Why do we care about transuranic elements?

The transuranic elements are long-lived and radiotoxic, and certain transuranic elements can be used in nuclear weapons.

The easiest source of energy to recover from used fuel is the ~500 tonnes of plutonium in U.S. used fuel that has already accumulated; it has an energy equivalence of 6.6 billion barrels of oil, which is half of the estimated resources in Prudhoe Bay, Alaska.

Another issue is how long waste remains hazardous. The transuranic elements remain more radiotoxic than the original uranium ore for hundreds of thousands of years. If we can destroy the transuranics, then the waste hazard is dominated by fission products, which decay much more quickly, reducing the long-term hazard. They remain radiotoxic only for several centuries. Thus, instead of leaving a long-term liability for future generations to deal with, we can destroy it.

What can we do with transuranic elements?

There are two possible approaches or "*fuel cycles.*"

The "throw-away" approach stores the used fuel in the short term and eventually throws away the used fuel in a geologic waste repository.

The "recycle" approach extracts energy from transuranics while destroying them, thereby making them energy assets instead of waste liabilities.